REMARKS

Claims 1-12 are pending in the present application.

Applicants wish to thank Examiner Umez-Eronini for the helpful and courteous discussion granted to the Applicants' undersigned representative on October 22, 2003. During this discussion, various data and arguments were discussed to address the rejections under 35 U.S.C. § 103(a). Applicants wish to thank Examiner Umez-Eronini for withdrawing the previous rejections under 35 U.S.C. §102(b) over Ferrier et al and under 35 U.S.C. §103(a) over Ferrier et al in view of Yasushi et al. Reconsideration of the remaining grounds of rejection is requested.

The present invention provides an aqueous solution for micro-etching copper or a copper alloy comprising a main ingredient consisting of sulfuric acid and hydrogen peroxide, an assisting ingredient consisting of phenyltetrazole and a chloride ion source and a benzene sulfonic acid (see Claim 1). None of the prior art discloses or reasonably suggests the present invention, and as such cannot affect the patentability of the present invention.

The rejection of Claims 1-3, 6-9, and 12 under 35 U.S.C. §103(a) over Ferrier et al in view of Wong is traversed.

Ferrier et al disclose a process for treating metal surfaces with a composition comprising an oxidizer, an acid, a corrosion inhibitor, a source of halide ions and, optionally, a water-soluble polymer (see column 4, lines 8-24). However, at no point does Ferrier et al disclose or suggest the presently claimed composition. Specifically, Ferrier et al does not

disclose an aqueous solution containing a benzene sulfonic acid. The Examiner concedes this deficiency on page 6, lines 3-4 of paper number 5.

The Examiner has taken the position that since Wong describes the use of a phenol sulfonic acid, it would have been obvious to modify the composition of Ferrier et al by adding Wong's composition to increase the stability of the solution (paper number 8, page 4, lines 13-17).

However, Wong fails to provide any motivation to add phenol sulfonic acid to a solution containing the remaining components of Claim 1, much less provide the requisite expectation of the advantageous copper or copper alloy micro-etching properties. Specifically, neither Ferrier et al nor Wong disclose or suggest a composition comprising sulfuric acid and hydrogen peroxide, an assisting ingredient consisting of phenyltetrazole and a chloride ion source, and a benzene sulfonic acid, such as phenol sulfonic acid, as presently claimed. Applicants remind the Examiner that the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination (MPEP §2143.01).

In this instance, neither of Ferrier et al nor Wong suggests the desirability of combining their disclosures. Therefore, Applicants kindly request that the Examiner not use the present application as a guidepost to bring the disparate teachings of these references together.

Applicants further submit that even if the artisan had all three of these references in hand and thought to combine their teaches as alleged, the combined disclosures would still not provide a reasonable expectation of the advantageous properties flowing from the presently claimed invention.

Evidence to this effect may be found in both of the following:

1) The composition of Ferrier et al exhibits inferior adhesion with the resin as compared with the micro-etching agent of the present invention due to the use of tetrazole or benzotriazole as an azole (see Comparative Examples 3 and 4 of the present invention). Applicants have found if phenyltetrazole is used as an azole and chlorine is combined with the phenyltetrazole, adhesion of the treated surface of copper or copper alloy with a resin is remarkably increases.

On the other hand, although a benzene sulfonic acid such as phenol sulfonic acid described in Wong may increase stability of hydrogen peroxide, the benzene sulfonic acids are oxidized with hydrogen peroxide and produce a brown or black precipitate (see Page 8, lines 13-16). Benzotriazole as an azole as in the composition of Ferrier et al also induces production of a brown or black precipitate if continuously used (see Comparative Example 4 of the present invention).

Accordingly, Applicants have found that the combined use of a benzene sulfonic acid such as phenol sulfonic acid with a phenyltetrazole can control decomposition of hydrogen peroxide and prevent brown or black precipitate from being produced.

Thus, the finding that the combined use of a benzene sulfonic acid with chlorine and a phenyltetrazole in the micro-etching agent comprising sulfuric acid and hydrogen peroxide as main ingredients can remarkably increase adhesion of copper or copper alloy surfaces with a resin and can suppress decomposition of hydrogen peroxide without producing a brown or black precipitate is not obvious from the combined disclosures of Ferrier et al and Wong.

2) Applicants **submit herewith** a Declaration under 37 C.F.R. §1.132 executed by Ms. Sachiko Nakamura (the Nakamura Declaration) which compares the claimed invention to the disclosure of Ferrier et al. Specifically, the Nakamura Declaration provides an experiment to demonstrate the advantageous results obtained by the presence of a benzene sulfonic acid, namely cresol sulfonic acid, in the claimed etching solution.

In the experiment provided in the Nakamura Declaration, the solder heat resistance was evaluated in a micro-etching solution with a copper concentration of 50 g/l. This concentration is greater than that utilized in the micro-etching solution (10 g/l) used in Examples 1-6 and Comparative Examples 1-5 in the present specification, but corresponds to the concentration typically utilized in continuous use micro-etching solutions.

As described in the Nakamura Declaration, copper was dissolved in (a) a composition containing cresol sulfonic acid (composition 1) and (b) a composition without cresol sulfonic acid (composition 2). Subsequently, these compositions were sprayed onto glass fabric epoxy resin-impregnated copper-clad laminated boards, both sides of which were clad with a copper foil with a thickness of 18 μm at 25°C, thereby etching 2μm of the copper surface. After processing the glass fabric epoxy resin-impregnated prepreg these test pieces were immersed in a molten solder bath at 270°C for 60 seconds according to JIS C6481 and removed from the bath to evaluate swelling. (page 2 of the Nakamura Declaration)

At this point, clear differences can be observed between the glass fabric epoxy resin-impregnated prepregs obtained using compositions 1 and 2 (see Test Pieces 1 and 2 attached to the Nakamura Declaration).

The Nakamura Declaration also provides an evaluation of the peel-off strength of a glass fabric epoxy resin-impregnated prepreg obtained by spraying the micro-etching compositions onto the shiny side of copper foils with a thickness of 70 μm at 25°C, thereby etching 2 μm of the copper surface (bridging pages 2 and 3 of the Nakamura Declaration). In this experiment, the glass fabric epoxy resin-impregnated prepreg was laminated and pressed onto the treated surface of the copper foil. Subsequently, the copper foil was removed except for an area corresponding to a stripe having a width of 1 cm according to JIS C6481.

For the Examiner's convenience, the results obtained from these experiments and presented in Table 2 (page 3 of the Nakamura Declaration) is reproduced below:

	Amount (g/l)		Micro-etching agent before dissolving copper		Micro-etching agent after dissolving copper (50 g/l)	
			Solder heat resistance	Peel-off strength (N/mm)	Solder heat resistance	Peel-off strength (N/mm)
Comp. 1	Sulfuric acid Hydrogen peroxide 5-Phenyltetrazole Cresol sulfonic acid Sodium chloride (Chloride ion conc.) Ion exchanged water	200 50 0.35 10 10 ppm (Balance)	No prepreg swelling	1.3	No prepreg swelling (Test piece 1)	1.1
Comp. 2	Sulfuric acid Hydrogen peroxide 5-Phenyltetrazole Sodium chloride (Chloride ion conc.) Ion exchanged water	200 50 0.35 10 ppm (Balance)	No prepreg swelling	1.3	Prepreg swelling (Test piece 1)	1.0

Based on the foregoing, it is clear that the claimed aqueous solution for micro-etching copper or a copper alloy comprising a main ingredient consisting of sulfuric acid and hydrogen peroxide, an assisting ingredient consisting of phenyltetrazole and

a chloride ion source, and a benzene sulfonic acid provides a significant advantage over a solution lacking the benzene sulfonic acid (i.e., Ferrier et al). Specifically, the results show that the etching solution not containing cresol sulfonic acid cannot exhibit the required solder heat resistance at a copper concentration as high as 50 g/l, which is the typical concentration utilized in continuous etching operations. Neither Ferrier et al nor Wong disclose or suggest the increased solder heat resistance due to the addition of cresol sulfonic acid.

Citing In re Royka, 490 F.2d 981, 180 USPQ 580 (CCPA 1974), MPEP §2143.03 states: "To establish a prima facie obviousness of a claimed invention, all the claim limitations must be taught or suggested by the prior art." Applicants submit that based on the failure of Ferrier et al and Wong to disclose or suggest the presently claimed compositions and the advantages obtained thereby, the disclosure of Ferrier et al and Wong fail to meet this requirement.

Applicants request withdrawal of the obviousness rejection over Ferrier et al in view of Wong.

The rejection of Claims 4 and 5 under 35 U.S.C. §103(a) over Ferrier et al in view of Wong and further in view of Yasushi et al is obviated by amendment.

As discussed above, Ferrier et al fails to disclose the claimed aqueous solution for micro-etching copper or a copper alloy. Specifically, Ferrier et al is silent with respect to the inclusion of a benzene sulfonic acid. Wong describes the use of a phenol sulfonic acid; however, sufficient motivation and/or a reasonable expectation of success are not provided when the disclosure of Ferrier et al is combined with the disclosure of Wong.

Yasushi et al discloses a micro-etching agent containing at least one tetrazole or tetrazole derivative (see English Abstract). However, Yasushi et al is also silent with respect to the inclusion of a benzene sulfonic acid. Therefore, Yasushi et al fails to compensate for the deficiency in the disclosure of Ferrier et al. Moreover, the mere fact that references can be combined or modified does not render the resultant combination obvious unless the prior art also suggests the desirability of the combination (MPEP §2143.01). In this instance, none of Ferrier et al, Wong or Yasushi et al suggests the desirability of combining their disclosures.

MPEP §2142 states: "To establish a *prima facie* case of obviousness, three basic criteria *must be met*. First, there must be some suggestion or motivation... to modify the reference... Second, there must be a reasonable expectation of success. Finally, the prior art reference... must teach or suggest all the claim limitations." (*emphasis added*) Even if the artisan were to combine the disparate disclosures of Ferrier et al, Wong and Yasushi et al, in the absence of a suggestion therein, there would be no reasonable expectation of the advantageous results obtained thereby (see the Nakamura Declaration). Therefore, the combined disclosures of Ferrier et al, Wong and Yasushi et al would fail to render the present invention obvious as the combined disclosures fail to meet at least two of the three requisite standards for determining obviousness.

For the foregoing reason, Applicants submit that the present invention would not be obvious in view of the combined disclosures of Ferrier et al, Wong and Yasushi et al. Withdrawal of this ground of rejection is required.

Finally, Applicants remind the Examiner that MPEP §821.04 states:

> ...if applicant elects claims directed to the product, and a product claim is subsequently found allowable, withdrawn process claims which depend from

or otherwise include all the limitations of the allowable product claim *will be* rejoined. (*emphasis added*)

Applicants respectfully submit that should elected Group I (Claims 1-9 and 12) be found allowable, non-elected process Claims 10-11 (Group II) should be rejoined.

Applicants submit that the present application is now in condition for allowance. Early notification of such action is earnestly solicited.

Respectfully submitted,

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